3 March 1999 Errata to
Airborne Synthetic Aperture Radar Support Data Extensions, 20 June 1996

1. Cover page, change title

From

Airborne Synthetic Aperture Radar (SAR) Support Data Extensions (SDE) for the National Imagery Transmission Format (Version 2.0) of the National Imagery Transmission Format Standards

To

Airborne Synthetic Aperture Radar (SAR) Support Data Extensions for the National Imagery Transmission Format of the National Imagery Transmission Format Standards

2. Cover page, add official seal

3. Cover page, add Approved by NITF Technical Board 20 May 1996

4. Throughout, change NITF 2.0 **to** NITF

5. Throughout, change GMT **to** UTC

6. Section 1.1, change:

From

This appendix specifies the format and content of a set of controlled tagged record extensions for the NITF 2.0 file format. The specified tagged records incorporate all Support Data Extensions relevant to primary imagery processed from Synthetic Aperture Radar (SAR) data. The information which makes up the SDE is derived from referenced interface documents. Systems using SAR imagery formatted according to NITF 2.0 should be designed to extract the needed data from the tagged records described herein. Raw SAR data is in the form of complex video phase history which must be processed in order to form an image. It is the processed imagery, not video phase history, that is stored in the NITF 2.0 file format.

To

This appendix specifies the format and content of a set of controlled tagged record extensions for the NITF file format relevant to primary imagery processed from Synthetic Aperture Radar (SAR) data; other support data extensions relevant to airborne SAR are defined in Visible, Infrared, and

Multispectral Airborne Sensor Support Data Extensions, RMAG-9709-001 (VIMAS). The information which makes up the SDE is derived from referenced interface documents. Systems using SAR imagery formatted according to NITF should be designed to extract the needed data from the tagged records described within these two documents. Raw SAR data is in the form of video phase history which must be processed in order to form an image. Normally, it is the processed imagery, not video phase history, that is stored in the NITF file format.

7. Add section 1.5:

1.5 Comments.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to Reconnaissance Mission Area Group, 2640 Loop Road W, Wright-Patterson AFB OH 45433-7106.

8. Add heading immediately after 4.2 Technical Notes on Coordinate Systems:

4.2.1 Image Coordinates

9. Section 4.2.1, between Figure 1 and Figure 2, change:

From

The order of pixels within each image row must be reversed …

To

The order of pixels within each image row might need to be reversed …

10. Add Section 4.2.2:

4.2.2 Locations

Figure 3 shows the earth coordinate frame, the local North-East-Down (NED) coordinate frame, and the platform location parameters: latitude and longitude. The platform location parameters define the location in earth coordinates of the sensor platform, or more specifically, the platform center of navigation. The center of navigation is the origin of the local NED coordinate frame. The local NED coordinates are North N, East E, and Down D as shown.

The location of the center of navigation within the platform is not relevant because platform dimensions are small relative to the positional errors in the support data.

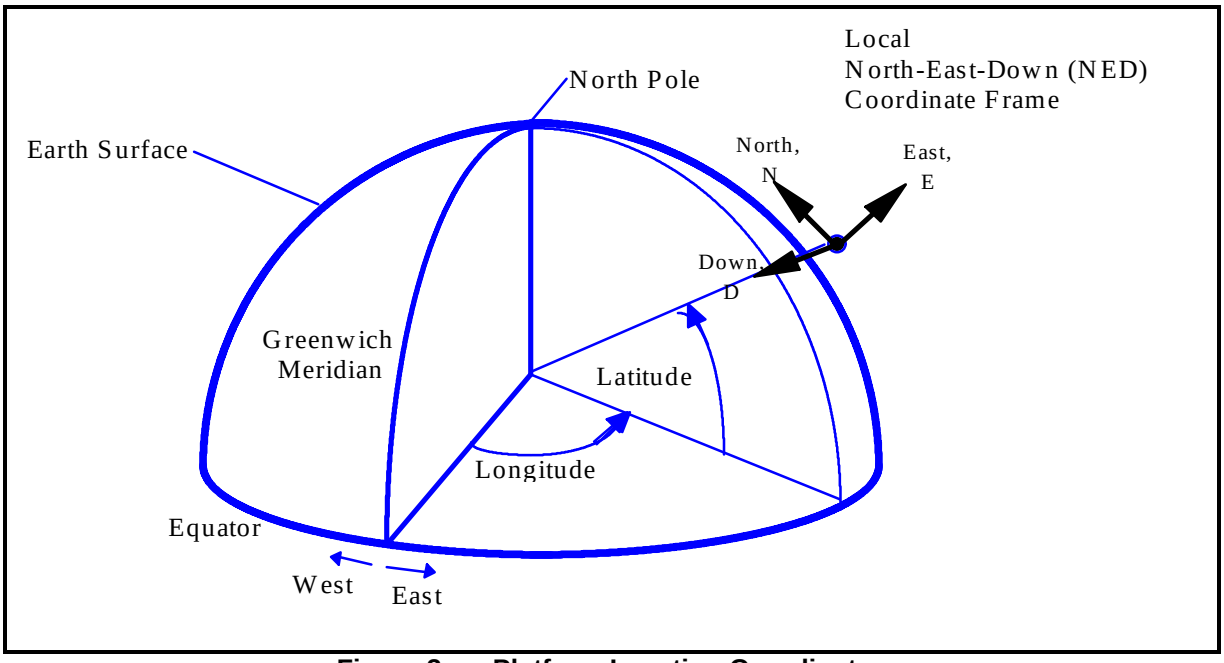

Figure 3 Platform Location Coordinates

The earth surface in Figure 3 is described in the World Geodetic System of 1984 (WGS-84) as two different model surfaces. The two surfaces are an ellipsoid and a geoid (see Figure 4). The ellipsoid is an ideal mathematical surface; the geoid is the mean-sea-level surface of the earth as determined by gravitational potential (elevation of the geoid relative to the ellipsoid varies with location from -102 to +74 meters). Platform latitude and longitude are referenced to the ellipsoid, while platform altitude MSL is defined with respect to the geoid: Altitude MSL is the vertical distance from mean sea level to the platform.

The Down-axis (D) of the NED coordinate frame lies normal to the geoid. That is, D lies in the direction of gravitational acceleration. The North-axis (N) and East-axis (E) lie in the geometric plane perpendicular to D (the horizontal plane), with N in the direction of True North.

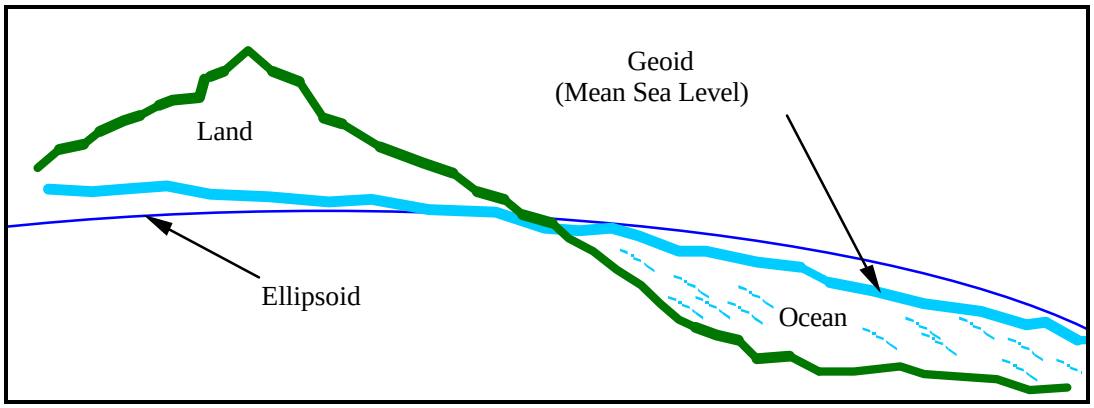

Figure 4 Ellipsoid and Geoid Models of the Earth Surface

11. Section 5.1.1, change:

From

The Additional Image ID tag is intended to be the most basic support data extension for SAR imagery, and is a prerequisite for all other tags defined in this document. The format for the user defined fields of the AIMIDA extension is detailed in Table 4, and the descriptions of these fields is detailed in Table 5. A single AIMIDA is placed in the Image Subheader. Where several Image Subheaders relate to a single scene, AIMIDA is placed in the first Image Subheader.

To

The Additional Image ID extension is used for storage and retrieval from standard imagery libraries. AIMID is a required component of all airborne imagery files. A single AIMID is placed in the image subheader; where several images relate to a single scene; an AIMID is placed in the first *or* may be placed in each applicable image subheader. The format for the user defined fields of the AIMIDA extension is detailed in Table 4, and the descriptions of these fields is detailed in Table 5. Note that the fields from MISSION_DATE through END_ROW, inclusive, also constitute the first forty characters of the Image Subheader ITITLE field.

12. Table 4, change selected entries:

MISSION_DATE	Aircraft T.O. Date	7	DDMonYY		R
MISSION_NO	Mission ID	4	Alphanumeric ~~0000 to 9999~~		R
FLIGHT_NO	Flight No.	2	00, 01 to 09, A1 to A9, B1 to B9, … Z1 to Z9		R
OP_NUM	Image Operation No.	3	~~001~~000 to 999		R
START_SEGMENT	Starting Segment ID.~~Reserved~~	2	AA to ZZ, spaces		O~~R~~
REPRO_NUM	Reprocess No.	2	00 to 99		R
REPLAY	Retransmission No.	3	000, T01 to T99, G01 to G99, P01 to P99		R
	reserved	1	space		R
START_COLUMN	Starting Tile Column Number.~~Block No.~~	2	01 to 9927		R
START_ROW	Starting Tile row Number.~~"~~	5	00001 to 99999		R
END_SEGMENT	Ending Segment.~~Reserved~~	2	AA to ZZ, spaces		O~~R~~
END_COLUMN	Ending Tile Column Number.~~Block No.~~	2	01 to 9927		R
END_ROW	Ending Tile Row Number.~~"~~	5	00001 to 99999		R

13. Table 5, change/add selected entries:

MISSION_NO	Four ~~digit~~ character descriptor of the mission. Contents are user defined, except that at least one character must not be numeric.
FLIGHT_NO	Each flight shall be identified by a~~A~~ flight number in the range 01 to 09~~06~~. Flight 01 shall be the first flight of the day, flight 02 the second, etc. In order to ensure uniqueness in the image id, if the aircraft mission extends across midnight ~~GMT~~UTC, the flight number shall be 0x (where x is in the range 0 to 9~~6~~) on images acquired before midnight ~~GMT~~ UTC and Ax on images acquired after midnight ~~GMT~~UTC; for extended missions Bx, … Zx shall designate images acquired on subsequent days. The value 00 indicates the flight number is unavailable.
OP_NUM	Imaging operation number. Reset to 001 at the start of each flight. A value of 000 indicates the airborne system does not number imaging operations.
START_SEGMENT	Start Segment ID. Identifies images as separate pieces (segments) within an imaging operation. AA is the first segment, AB is the second segment, etc. Spaces indicate the image is not segmented.
REPRO_NUM	Reprocess Number. For SAR imagery this field indicates whether the data was reprocessed to overcome initial processing failures, or has been enhanced. A "00" in this field indicates that the data is an originally processed image, a ~~range of~~ "01~~" to "99~~" indicates the ~~data is~~first ~~reprocessed~~reprocess/enhancement, etc. For visible and infrared imagery this field shall contain “00” to indicate no reprocessing or enhancement..
REPLAY	Replay indicates whether the data was reprocessed to overcome initial processing failures, or retransmitted to overcome reception errors. A "000" in this field indicates that the data is ~~from~~ an originally ~~transmission~~processed and transmitted image, a value in the range of "T01" to "T99" indicates the data was retransmitted. Values in the range of "G01" to "G99" and "P01" to "P99" ~~are reserved for possible future implementation.~~indicate the data is reprocessed.
START_COLUMN	Starting Tile Column Number. For tiled (blocked) sub-images, the number of the first tile relative to start of the original image tiling within this segment. Tiles are rectangular arrays of pixels that subdivide an image. For untiled images this field shall contain 01.~~Starting column Block No. (cross scan direction).~~
START_ROW	Starting Tile Row Number. For tiled (blocked) sub-images, the number of the first tile relative to start of the original image tiling within this segment. For untiled images this field shall contain 00001.~~Starting row Block No. (along scan direction).~~
END_SEGMENT	Ending Segment. Ending segment ID of this file. Spaces indicate the image is not segmented.
END_COLUMN	Ending Tile Column Number. For tiled (blocked) sub-images, the number of the last tile relative to start of the original image tiling within this segment. For untiled images this field shall contain 01.~~Ending column Block No. (cross scan direction).~~

END_ROW	Ending Tile Row Number. For tiled (blocked) sub-images, the number of the last tile relative to start of the original image tiling within this segment. For untiled images this field shall contain 00001.~~Ending row Block No. (along scan direction).~~

14. Table 6, change selected entries:

SQUINT_ANGLE	Squint Angle	3	~~±60~~-60 to +85	degrees	R

15. Table 7, change selected entries:

SQUINT_ANGLE	The angle measured in degrees from crosstrack (broadside) to the great circle joining the ground point directly below the Aircraft Reference Point (ARP) to the Output Reference Point (ORP). Forward looking squint angles range from 0 (broadside) to +85~~60~~ degrees; aft looking squint angles range from 0 to -60 degrees.

16. Section 5.1.5, add before first sentence:

Image Block Information is optional, but often needed for exploitation of imagery.

17. Table 8, change selected entries:

N_GRAY	SAR: No. of gray fill samples EO-IR: spaces	5	00000 to 99999 spaces		O~~R~~
LAYOVER_ANGLE	Radar Layover Angle	3	000 to 359, spaces	degrees	O
SHADOW_ANGLE	Radar Shadow Angle	3	000 to 359, spaces	degrees	O
FRLC_LOC	First Row Last Column Location	21	Xddmmss.ssYdddmmss.ss ±dd.dddddd±ddd.dddddd spaces		O~~R~~
LRLC_LOC	Last Row Last Column Location	21	Xddmmss.ssYdddmmss.ss ±dd.dddddd±ddd.dddddd spaces		O~~R~~
LRFC_LOC	Last Row First Column Location	21	Xddmmss.ssYdddmmss.ss ±dd.dddddd±ddd.dddddd spaces		O~~R~~
FRFC_LOC	First Row First Column Location	21	Xddmmss.ssYdddmmss.ss ±dd.dddddd±ddd.dddddd spaces		O~~R~~

18. Table 9, change selected entry:

FRLC_LOC LRLC_LOC LRFC_LOC FRFC_LOC	Latitude and longitude at the first row, last column of the image block. Latitude and longitude at the last row, last column of the image block. Latitude and longitude at the last row, first column of the image block. Latitude and longitude at the first row, first column of the image block. The format Xddmmss.ss represents degrees (00-89), minutes (00-59), seconds (00-59), and hundredths of seconds (00-99) of latitude, with X = N for north or S for south, and Yddmmss.ss represents degrees (000-179), minutes (00-59), seconds (00-59), and hundredths of seconds (00-99) of longitude, with Y = E for east or W for west. The format ±dd.dddddd indicates degrees of latitude (north is positive), and ±ddd.dddddd represents degrees of longitude (east is positive). These locations, at lower precision, are also contained in IGEOLO of the image subheader. Note that the order of these coordinates is different from IGEOLO. Spaces indicate the value of a coordinate is unavailable or inapplicable.

19. Table 11, change selected entry:

SEC_BE	Basic Encyclopedia ID of secondary target, including the OSUFFIX (target designator).

20. Section 5.1.5, add:

MPDSRA provides additional information required by most advanced image mensuration programs, such as RULER; it is optional, but required for accurate mensuration. This extension is designed to be used with the information contained in a companion BLOCKA extension (identified by BLK_NUM) supporting the same image block..

21. Table 12, change selected entries:

ORP_ROW	Row Containing ORP	5	00001 to 19999 ~~13600~~		O
ORP_COLUMN	Column Containing ORP	5	00001 to 19999 ~~16384~~		O

22. Table 13, change selected entries:

BLK_NUM	BLOCK_INSTANCE (see BLOCKA) to which this mensuration data applies. ~~Image block number in which the Output Reference Point occurs.~~

23. Section 5.1.6, add:

MENSRA provides the collection geometry parameters required by image mensuration programs; it is optional, but its use will allow more accurate mensuration. .

24. Table 14, change selected entries:

CCRP_ROW	CCRP row number	5	00000 to 19999 ~~13600~~		R
CCRP_COL	CCRP column number	5	00000 to 19999 ~~16384~~		R

25. Section 5.1.7, add:

ACFT provides miscellaneous information unique to airborne sensors.

26. Table 16, change selected entries:

AC_MSN_ID	Aircraft Mission Identification	10	Alphanumeric, "NOT AVAIL."		R
SCTYPE	Scene Type C = Collection Plan R = Retasked space = Immediate, or Unplanned	1	C,R,space ~~C = Collection Plan~~ ~~R = Retasked~~ ~~space = Immediate, or Unplanned~~		R
SENSOR_ID	Sensor ID	3	Alphanumeric		R
PATCH_TOT	Total No. of Patches	4	SAR: Spot: 0001 Search: 0001 to 0999 EO-IR: 0000		R
MTI_TOT	Total Number of MTI Packets	3	SAR: 000 to 999 ~~120~~ EO-IR: 000		R
IMREQID	Immediate Scene Request Id	5	00000 to 99999 ~~32767~~		O
MPLAN	Mission Plan Mode	2	01 to 99 ~~13~~		R
ENTLOC	Entry Location	21	ddmmss.ssXdddmmss.ssY ±dd.dddddd±ddd.dddddd		R
EXITLOC	Exit Location	21	ddmmss.ssXdddmmss.ssY ±dd.dddddd±ddd.dddddd		O
TMAP	True Map Angle	7	000.000 to 180.000, 999.999	degrees	R
ROW_SPACING	Row spacing	7	SAR: 00.0000 to 99.9999 EO-IR: 0000.00 to 9999.99	ft µ-radians	R
COL_SPACING	Column spacing	7	SAR: 00.0000 to 99.9999 EO-IR: 0000.00 to 9999.99	ft µ-radians	R

27. Table 17, change selected entries:

AC_MSN_ID	Name of the Mission. "NOT AVAIL." (without quotes) shall be used if the Mission name is unavailable.
SENSOR_ID	Sensor ID. Identifies which specific sensor produced the image. ASR = ASARS-2 APG = APG-73 DST = DarkStar Other sensors: TBD
MTI_TOT	Total Number of MTIRPA extensions contained in this file. Each MTIRPA identifies 1 to ~~256~~ 999 moving targets.
PDATE	~~The~~ Processing Date. SAR: when raw data is converted to imagery. EO-IR: when image file is created. DD is the day of the month (00 to 31), Mon is the month (JAN – DEC), and YY is the year. This date changes at midnight UTC ~~is the day, month and year that the raw data is converted to imagery.~~
IMHOSTNO IMREQID	Only valid for immediate scenes. Together they will denote the scene that the immediate was initiated from and can be used to renumber the scene, Example: If the immediate scene was initiated from scene number 123 and this is the third request from that scene, then the scene number field will be zero, the immediate scene host field will contain 123 and the immediate scene request id will contain 3. ~~The scene can then be redesignated as scene 123.3 or converting three to an alpha character the scene can be referred to as 123C.~~
SCENE_SOURCE	The Scene Source indicates the origin of the request for the current scene. A scene is a single image or a collection of images providing contiguous coverage of an area of interest. 0 = Preplanned 1-6 = Sensor Specific: For ASARS-2: 1 = Scene Update (uplink) 2 = Scene Update (Manual) (Via pilot's cockpit display unit) 3 = Immediate Scene (Immediate Spot or Search Range Adjust) 4 = Spare 5 = Preplanned Tape Modification 6 = SSS Other Sensors: TBD.

MPLAN	The Mission Plan Mode describes the current sensor specific collection mode. For ASARS-2: 01 = Search 02 = Spot 3 04 = Spot 1 07 = Continuous Spot 3 08 = Continuous Spot 1 09 = EMTI Wide Frame Search 10 = EMTI Narrow Frame Search 11 = EMTI Augmented Spot 12 = EMTI Wide Area MTI (WAMTI) 13 = Monopulse Calibration Other Sensors: TBD. 14 – 99 are reserved.
ENTLOC ENTALT EXITLOC EXITALT	In ~~the~~ SAR Search mode and EO-IR Wide Area Search modes, the entry and exit locations are the specified latitude, longitude and altitude above mean sea level (MSL) of the planned entry and exit points on the scene centerline of the area to be imaged. In ~~the~~ EO-IR and SAR Spot modes, and EO-IR Point Target modes, the entry location is the specified Spot center latitude/longitude/altitude, and the exit location is not used. The location may be expressed in either degrees-minutes-seconds or in deimal degrees. The format ddmmss.ssX represents degrees (00-89), minutes (00-59), seconds (00-59), and hundredths of seconds (00-99) of latitude, with X = N for north or S for south, and dddmmss.ssY represents degrees (000-179), minutes (00-59), seconds (00-59), and hundredths of seconds (00-99) of longitude, with Y = E for east or W for west.. The format ±dd.dddddd indicates degrees of latitude (north is positive), and ±ddd.dddddd represents degrees of longitude (east is positive). The altitude is expressed in feet.

TMAP	SAR: In Search modes, the true map angle is the angle between the scene center line ~~to~~ and the ground projection of the ~~antenna look vector~~line of sight ~~expressed in degrees~~. In Spot modes, the true map angle is the angle, measured at the central reference point, between a line ~~through the CCRP~~ parallel to the aircraft desired track heading ~~to~~ and the ground projection of the ~~vector from the aircraft to CCRP~~line of sight. EO-IR: The true map angle is defined in the NED coordinate system with origin at the aircraft (aircraft local NED), as the angle between the scene entry line of sight and the instantaneous aircraft track heading vector. The aircraft track-heading vector is obtained by rotating the north unit vector of the aircraft local NED coordinate system in the aircraft local NE plane through the aircraft track-heading angle. The true map angle is measured in the slanted plane containing the scene entry line of sight and the aircraft track-heading vector. This angle is always positive. A value of 999.999 indicates the true map angle is unavailable.
RCS	Performance calibration value for SAR sensor equipment.
ROW_SPACING	SAR: Ground plane distance between corresponding pixels of adjacent rows. EO-IR: Angle between corresponding pixels of adjacent rows, measured in microradians at center of image
COL_SPACING	SAR: Ground plane distance between adjacent pixels within a row. EO-IR: Angle between adjacent pixels within a row, measured in microradians at center of image.
SENSERIAL	Sensor vendor's serial number. Serial number of the line replaceable unit (LRU) containing EO-IR imaging electronics or SAR Receiver/Exciter involved in creating the imagery contained in this file.~~Sensor (Receiver/Exciter) Serial Number~~

28. Section 5.1.8, change:

From

The format for the user defined fields of the PATCHA extension is detailed in Table 18, and the descriptions of these fields is detailed in Table 19. A search scene typically consists of many abutting patches; each patch of the scene may be treated as an independent image and placed into a separate file, or the multiple patches (up to 999) of a scene may all be placed into a single file. There will always be 1 patch per file in spot mode. PATCHA occurs once for each patch, and is placed in the Image Subheader containing the described patch.

To

PATCHA provides information describing a portion of an image, a *patch*, to support exploitation. In order to achieve the specified resolution in a SAR image, the phase history data must be continuously collected over a calculated flight path distance; this *batch* of phase history is than processed into one SAR image patch. A search scene typically consists of many abutting or overlapping patches; each patch of the scene may be treated as an independent image and placed into a separate file, or the multiple patches of a scene (up to 999) may all be placed into a single

NITF file. PATCHA contains support data pertaining to a single image patch, and one PATCHA extension is created for each image patch; The PATCH_TOT field of ACFTA contains the total number of patches (and PATCHA extensions) contained in the file. For spot modes there will normally be one patch, and PATCHA may be omitted if all necessary information appears elsewhere in the file. PATCHA is placed in the Image Subheader containing the described patch**.** The format for the user defined fields of the PATCHA extension is detailed in Table 18, and the descriptions of these fields is detailed in Table 19.

29. Table 18, change selected entries:

LNSTOP	End line number for this patch	7	~~0000200~~ 0000020 to 9999999		R
AZL	Number of Azimuth Lines	5	~~00200~~ 00020 to 99999	lines	R
NVL	Number of valid azimuth lines	5	~~00200~~ 00020 to 99999	lines	O
NPIXEL	No. of image pixels per line	5	Spot: 00170 to 06000 ~~02720~~ Search: 00272 to 08160	pixels	R
~~GMT~~UTC	~~Greenwich Mean Time~~Coordinated Universal Time	8	00000.00 to 86399.99	seconds	R
GRAVITY	Local Gravity	7	31.0000 to 33.9999	ft/sec^2	~~R~~O
INS_V_NC	Ins Platform Velocity, North	5	±9999 ~~00000 to 99999~~	ft/sec	R
INS_V_EC	Ins Platform Velocity, East	5	±9999 ~~00000 to 99999~~	ft/sec	R
INS_V_DC	Ins Platform Velocity, Down	5	±9999 ~~00000 to 99999~~	ft/sec	R
OFFLAT	Geodetic Latitude Offset	8	±80.0000	seconds	~~R~~O
OFFLONG	Geodetic Longitude Offset	8	±80.0000	seconds	~~R~~O
SHEAR	Patch Shear Factor	8	0.850000 to 1.000000		~~R~~O

30. Table 19, change selected entries:

AZL	This variable indicates how many lines are in the current patch~~. In Search Mode, each patch consists of from 200 to 1600 azimuth lines. Because the number of lines is a constant in the Spot mode, this variable is set to 2,720.~~
~~GMT~~UTC	The Coordinated Universal ~~Greenwich Mean~~ Time (UTC~~GMT~~) is the time in seconds (accurate to 0.01 seconds) of the start of the current patch or, in the case of Spot, the current scene or frame. UTC~~GMT~~ uses a 24 hour clock where a value of 0 corresponds to 2400 hours.

INS_V_NC INS_V_EC INS_V_DC	The Inertial Navigator Platform velocity is given in a North, East, Down earth-fixed coordinate system. The measurements are given in units of feet/second. These parameters are valid at the time specified by GMT.

31. Section 5.1.9, add:

This optional extension provides a standard format to report moving targets located by the radar system. MTIRP may accompany an associated image, in which case this extension is placed in the image subheader. If no image accompanies MTIRP, it is placed in the file header and the first 40 characters of the FTITLE field in the file header are filled in accordance with table 22. As many as 256 targets may be reported in a single extension; multiple extensions may be included in a single header (see MTI_TOT in ACFTA).

32. Table 20, change selected entries:

MTI_PACKET_ID	MTI Packet Id Number	3	001 to 999~~120~~		R
UTC~~GMT~~	Coordinated Universal Time ~~Greenwich Mean Time~~	8	00000.00 to 86399.99	seconds	R
SQUINT_ANGLE	Squint Angle	5	-60.0 to +85.0 ~~±60.0~~	degrees	O

33. Table 21, change selected entries:

UTC~~GMT~~	Time in seconds past midnight UTC~~GMT~~ when the targets identified in this report were scanned by the sensor.

34. Add Table 22:

Table 22. FTITLE Contents for MTI-only Files

FTITLE Location (Bytes)	Content
1 3	"MTI"
4 17	FDT field from file header
18 37	AC_MSN_ID field from AIMIDA
38 40	spaces